

CLAIMS

1. A display element comprising a light source and a waveguide that propagates a light emitted from the light source, wherein the light
5 propagated in the waveguide is extracted to outside from a waveguide lateral face, and
wherein the light is extracted out of the waveguide from the waveguide lateral face by changing a shape of the waveguide lateral face.
- 10 2. The display element according to claim 1, further comprising a plurality of actuators that change a shape of the waveguide,
wherein the shape of the waveguide lateral face is changed by selectively operating the actuators to extract the light out of the waveguide from the waveguide lateral face.
- 15 3. The display element according to claim 2, wherein the waveguide comprises a core and a cladding formed along one lateral face of the core,
wherein the actuators are attached to the cladding and the shape of the waveguide lateral face is changed by deforming the actuators.
- 20 4. The display element according to claim 3, wherein the light is extracted out of the waveguide by deforming at least a portion of the core of the waveguide.
- 25 5. The display element according to claim 2, wherein the actuators are attached to the waveguide lateral face, and
wherein the shape of the waveguide lateral face is changed by deformation of the actuators.
- 30 6. The display element according to claim 2, wherein the actuators comprise a piezoelectric element, and
wherein the shape of the waveguide lateral face is changed by deforming the piezoelectric element by applying a voltage to the piezoelectric element.
- 35 7. The display element according to claim 4, wherein the actuators comprise a first electrode film arranged at the waveguide lateral face,

a piezoelectric element layered on the electrode film, and
a second electrode film layered on the piezoelectric element,
wherein the shape of the waveguide lateral face is changed by
deforming the piezoelectric element by applying a voltage between the
5 first electrode film arranged at the waveguide lateral face and the second
electrode film layered on the piezoelectric element.

8. The display element according to claim 2, wherein the actuators
comprise a convex portion, and
10 wherein the shape of the waveguide lateral face is changed by
applying pressure to the waveguide lateral face with the convex portion.

9. The display element according to claim 2, wherein the actuators
comprise: an electrode film arranged at the waveguide lateral face, and
15 an external electrode film that is in opposition to and adjacent to
the waveguide,
wherein the shape of the waveguide lateral face is changed by an
electrostatic force produced by applying a voltage between the external
electrode film and the electrode film.

20 10. The display element according to claim 9, wherein the external
electrode film comprises a convex portion at the waveguide lateral face,
and a shape of the waveguide lateral face is changed by the convex
portion of the external electrode film applying pressure to the waveguide
25 lateral face by using the electrostatic force.

11. The display element according to claim 2, wherein the light is
extracted out of the waveguide by deforming at least a portion of the core
of the waveguide.

30 12. The display element according to claim 2, wherein at least a
portion of the waveguide comprises an elastic material.

13. The display element according to claim 2, wherein at least a
35 portion of the waveguide comprises a transparent gel.

14. The display element according to claim 2, wherein the actuators

are formed for each pixel.

15. The display element according to claim 1,
wherein the waveguide comprises a waveguide electrode film on
5 the waveguide lateral face,
the display element further comprising an opposing electrode film
that opposes the waveguide electrode film, and
particles arranged between the waveguide electrode film and the
opposing electrode film,
10 wherein, by applying a voltage between the waveguide electrode
film and the opposing electrode film, the particles and the waveguide
electrode film are brought into contact such that the particles and the
waveguide become integrated, changing the shape of the waveguide
lateral face and extracting the light out of the waveguide from the
15 waveguide lateral face.
16. The display element according to claim 15, wherein the light is
extracted out of the waveguide by deforming at least a portion of the core
of the waveguide.
20
17. The display element according to claim 15, wherein the particles
are electrically charged.
18. The display element according to claim 15, wherein the particles
25 are magnetic.
19. The display element according to claim 15, wherein a surface
tension of the waveguide electrode film and a surface tension of a surface
of the particles are different from each other.
30
20. The display element according to claim 15, wherein a coating
material is applied to the waveguide electrode film.
21. The display element according to claim 15, wherein the
35 waveguide electrode film and the opposing electrode film are provided for
each pixel.

22. The display element according to claim 15, wherein the particle is fluorescent.
23. The display element according to claim 22, wherein the light
5 source emits ultraviolet light.
24. The display element according to any of the claims 1 to 21, wherein the light source is a 3-color LED or a 3-color laser.
- 10 25. A display device comprising:
the display element according to any of the claims 2 to 14,
a light source drive circuit for driving the light source,
an actuator drive circuit for driving the actuator, and
a control circuit that controls the light source drive circuit and
15 the actuator drive circuit.
26. A display device comprising:
the display element according to any of the claims 15 to 23,
a light source drive circuit for driving the light source,
20 a particle drive circuit for applying a voltage between the
waveguide electrode film and the opposing electrode film, and
a control circuit that controls the light source drive circuit and
the particle drive circuit.
- 25 27. A display device comprising:
the display element according to claim 14, and
an active matrix element that controls the respective actuators.
28. A display device comprising:
30 the display element according to claim 21, and
an active matrix element that controls respective voltages
between the waveguide electrode films and the opposing electrode films.
29. The display device according to claim 27 or 28, wherein the active
35 matrix element is a TFT or a TFD.